DDC
ILC DATA DEVICE CORPORATION®

SDC-630/632/634* A/ST

10, 12 OR 14 BIT S/D OR R/D CONVERTER

This preliminary data sheet provides detailed functional capabilities for product currently in prototype production. These specifications are being provided to aid electrical design, layout, and operation.

LOWER COST! PIN FOR PIN REPLACEMENT FOR *SDC-630/632/634 SERIES*. FOR ALL NEW DESIGNS!

FEATURES

- **INDUSTRY STANDARD LOW PROFILE MODULAR CONVERTERS**

- **ACCURACY**

  10 BIT:21 MINUTES
  12 BIT:8.5 MINUTES
  14 BIT:4 MIN 0.9 LSB OR
  2.6 MIN (HIGH ACCURACY)

- **SIGNAL AND REF INPUT:**

  INTERNAL TRANSFORMER ISOLATION (A VERSION) OR LOW COST SOLID STATE BUFFERS (ST VERSION) ALL COMMON L-L LEVELS AND FREQUENCIES

- **OPTIONS (CONSULT FACTORY)**

  VELOCITY OUTPUT
  BIT -BUILT-IN-TEST
  16 BIT RESOLUTION

* PATENTED

DESCRIPTION

The SDC 630,632 and 634*A/ST series are low cost, low profile synchro to digital and resolver to digital tracking converters with standard pin configurations. They use a unique control transformer algorithm that provides inherently higher accuracy and jitter-free output. Utilizing a type II servo loop, these converters have no velocity lag up to the specified tracking rate and output data is always fresh and continuously available. Each unit is fully trimmed and requires no adjustments or calibrations in the field.

APPLICATIONS

These converters may be used wherever analog angle data from a synchro or resolver must be converted rapidly and accurately to digital form for transmission, storage or analysis. Because these units are extremely rugged and stable, and meet the requirements of MIL-STD-202E, they are suitable for the most severe industrial, commercial and military applications. Military ground support and avionics uses include ordnance control, radar tracking systems, navigations, and collision avoidance systems.
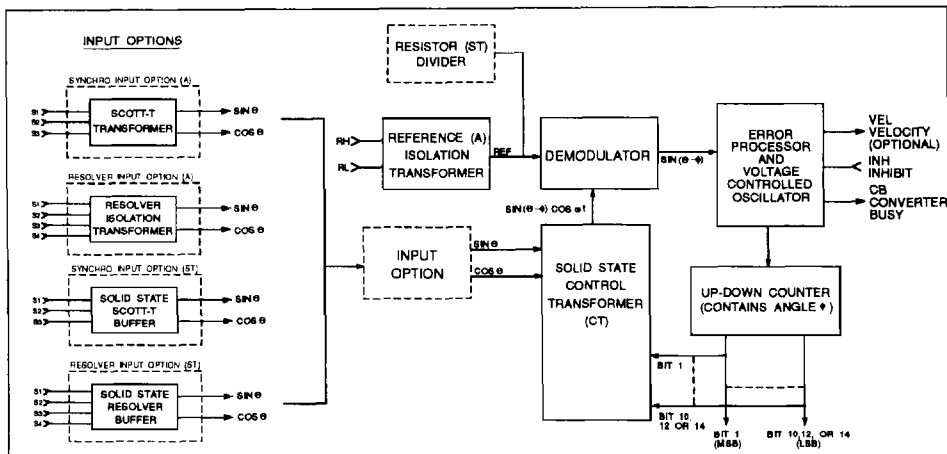

FIGURE 1. SDC-630/632/634* A/ST BLOCK DIAGRAM

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TABLE 1. SDC-630/632/634* A/ST SPECIFICATIONS

Apply over temperature range, power supply range, reference frequency and amplitude range, ±10% signal amplitude variation, and up to 10% harmonic distortion in the reference.

PARAMETERS	VALUE		
	SDC-630	SDC-632	SDC-634
RESOLUTION	10 bits	12 bits	14 bits
ACCURACY			
Standard Units	±21 min	±8.5 min	±4 min ±0.9 LSB
High Accuracy Option	-	–	±2.6 min

SIGNAL AND REFERENCE INPUT	Signal Frequency Range	Signal Input Impedance (L-L Balanced, Resistive)	
		A*	ST
Synchro Input			
90V L-L, 400 Hz (Option H)	350-1000 Hz	148 KΩ min	123K
90V L-L, 60 Hz (Option I)	47-1000 Hz	148 KΩ min	123K
11.8V L-L, 400 Hz (Option L)	350-1000 Hz	19 KΩ min	52K
Resolver Input			
90V L-L, 400 Hz (Option H)	350-1000 Hz	148 KΩ min	-
26V L-L, 400 Hz (Option M)	350-1000 Hz	42 KΩ min	-
11.8V L-L, 400 Hz (Option L)	350-1000 Hz	19 KΩ min	70K
Reference Input	Reference Voltage Range	Ref. Input Impedance (Resistive)	
Options H,I	40-150V rms	300 KΩ min	270K
Options M,L	10-50V rms	80 KΩ min	60K

*Transformer isolated. Other voltages and frequencies available on special order.

DIGITAL/INPUT OUTPUT	
Logic Type	TTL/CMOS Compatable
Inhibit Input (INH)	Logic "0" inhibits
	Does not interrupt converter tracking
Outputs	
Type	TTL/CMOS
10,12, or 14 (16-Consult Factory)	
Parallel Data Bits	Natural binary angle; positive logic
Converter Busy (CB)	0.5 to 1.5msec positive pulse. Data changes on leading edge.
Drive Capability	1 Std. TTL loads
Built-In-Test (BIT) - Special Order Consult Factory	

VELOCITY OUTPUT (ON SPECIAL ORDER ONLY)	
Polarity	
	Postive output for increasing angle
Std Voltage Range (full scale)	±4V Min (Other ranges available consult factory)
For other Velocity Characteristics Consult Factory	

POWER SUPPLIES			
Nominal Voltage	+15V Supply	-15V Supply	+5V Logic Supply
Voltage Range	+11 to +16.5V	-11 to -16.5V	+4.5 to +5.5V
Max. Voltage Without Damage	+18V	-18V	7V
Current (ALL)	20mA	25mA	10mA

TEMPERATURE RANGES	
Operating	
-1 Option	-55°C to +105°C
-3 Option	0°C to +70°C
Storage	-55°C to +125°C
PHYSICAL CHARACTERISTICS	
Size (Encapsulated Module)	3.125 x 2.625 x 0.43 inch
	(7.94 x 6.67 x 1.07 cm)
Weight	4 oz (113g)

DYNAMIC CHARACTERISTICS									
Bandwidth (nom F carrier)	**60 Hz**				**400 Hz**				**UNITS**
Carrier Frequency Range	47-1,000				360-1,000 (ST to 5k)				Hz
Bandwidth (Closed Loop)	15				100				Hz
Ka	1,100				48,000				1/s
A1	-145				1				1/s
A2	7,600				48,000				1/s
A	33				220				1/s
B	16.3				110				1/s
RESOLUTION	**10**	**12**	**14**	**16**	**10**	**12**	**14**	**16**	**BITS**
Tracking Rate (rps)									
typical	28.5	7.1	1.8	0.45	192	48	12	3	rps
minimum	24	6	1.5	0.37	160	40	10	2.5	rps
Acceleration (1 LSB lag)	370	93	23	5.8	17K	4,220	1,050	260	$^{o}/s2$
Settling time (179° step, max)	500	600	900	2,200	90	100	140	320	msec

## TECHNICAL INFORMATION

POWER SUPPLIES

The main power supplies can vary over their specified ranges with no change in the converter specifications except for a proportional change in the maximum tracking rates.

When testing or evaluating the converters, it is advisable to limit the current to each of the three power supplies. Set each limit to 50% greater than the maximum current listed for that supply in the specifications table.

TIMING

The figure below shows the timing waveforms of the converter. Whenever an input angle change occurs, the converter changes the digital angle in steps of 1 lsb, and generates a converter busy impulse (CB). The CB is a positive pulse 0.5 to 1.5u sec long. Data changes on the leading edge of the CB pulse, and data can be transferred 0.5μsec after the leading edge.

The simplest method of interfacing with a computer is to transfer data at a fixed time interval after the inhibit is applied. The converter will ignore an inhibit applied during the "busy" interval until that interval is over. Timing is as follows: (a) apply the inhibit, (b) wait 0.5μs, (c) transfer the data, and (d) release the inhibit. INH does not effect converter tracking.
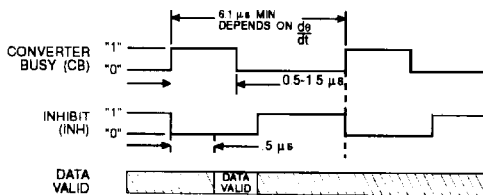
SDC-630/632/634* A/ST TIMING DIAGRAM

SIGNAL INPUTS

To prevent damage to the inputs, the maximum steady state voltage should not exceed the specified input voltage by more than 30%.

ACCOMMODATING NON-STANDARD INPUT VOLTAGES (A ONLY)

The signal and reference input levels can be resistively scaled to accommodate non-standard voltages. A converter should be selected that is the next lower standard voltage and the voltage is then scaled up with resistors in series with the synchro and/or reference inputs.

For a synchro input (SDC), a resistor R SIG is added in series with S1, S2 and S3, which is determined as follows:

$$R_{SIG} = 1.11K \text{ (New L-L Voltage - Standard Unit Voltage)}$$

That is 1.11K for each volt above that for which the standard unit is designed.

Example: An SDC-634A-L (11.8V) is to be used at 50V L-L

$$R_{SIG} - 1.11K (50-11.8) = 42.4K$$

The closest available high grade resistor with a low temperature coefficient of resistance should be used, and the three resistors should be matched to each other as closely as possible. In general, a 0.1% difference will introduce 1.7 arc minutes of additional error dur to the effect on SIN/COS ratio relationship.

The ABSOLUTE value of the resistor is not critical.

In the case of the RESOLVER version (RDC), the equation is:

$$R_{SIG} = 2.2K \text{ (New L-L level - Standard Unit L-L level)}$$

The calculated resistors are connected in series with S1 and S2 respectively. Note only two resistors required. The required resistor matching and its effect on accuracy, is the same as for a synchro input (See Figure). The Reference Voltage treatment is similar, but the value selected is not critical.

R_{Ref}=2.8K (New ref - standard ref)

Here, even a 10% tolerance is adequate.
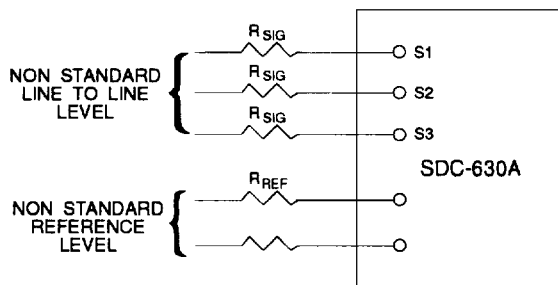
ORDERING INFORMATION

SDC - 634 A - H 1 a R

Reliability:
R = Enhanced Reliability

Accuracy:
a = High Accuracy Version
±2.6 Minutes (SDC-634 Only)

Temperature Range:
1 = -55 to 125°C
3 = 0 to 70°C

Signal Input Voltage and Frequency:
H = 90V L-L, 400 Hz (Synchro or Resolver)
I = 90V L-L, 60 Hz (Synchro Only)
M = 26V L-L, 400 Hz (Resolver Only)
L = 11.8V L-L, 400 Hz (Synchro or Resolver)

Transformer Type:
A = Internal Transformer
ST = Solid State

Resolution:
636 = 16 bits *Contact Factory
634 = 14 bits
632 = 12 bits
630 = 10 bits

Input Type:
SDC = Synchro
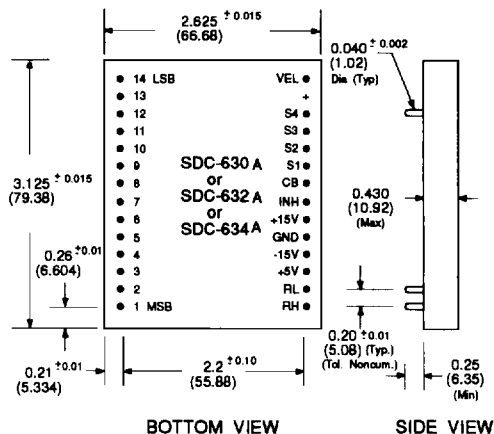RDC = Resolver

* For versions with Velocity or Built-in-Test Please Consult Factory.

PRE-02-10/93

Dimensions in inches (mm).

BOTTOM VIEW   SIDE VIEW

FIGURE 4. SDC-630/632/634A MECHANICAL OUTLINE

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